

What is claimed is:

1 1. A system for collection and analysis of regularly retrieved patient
2 information for automated remote patient care, comprising:
3 a medical device having a sensor for monitoring at least one physiological
4 measure of an individual patient and regularly recording and storing measures sets
5 comprising individual measures which each relate to patient information;
6 a database collecting one or more patient care records, comprising
7 organizing one or more patient care records which each comprise a plurality of
8 the collected measures sets and storing the collected measures set into a patient
9 care record for the individual patient; and
10 a server periodically receiving a set of the collected measures retrieved on
11 a substantially regular basis from the medical device, and analyzing one or more
12 of the collected measures sets in the patient care record for the individual patient
13 relative to one or more other collected measures sets stored in the database server
14 to determine a patient status indicator.

1 2. A system according to Claim 1, further comprising:
2 the server receiving a set of quality of life measures recorded by the
3 individual patient, and determining a change in patient status by comparing at
4 least one recorded quality of life measure to at least one other corresponding
5 recorded quality of life measure; and
6 the database storing the collected quality of life measures set into the
7 patient care record for the individual patient within the database.

1 3. A system according to Claim 1, further comprising:
2 the server repeatedly receiving one or more collected measures sets which
3 are each recorded by a sensor which monitors at least one physiological measure
4 of the individual patient, each such sensor monitoring a site within the individual
5 patient unique from the site monitored by any other such sensor, and analyzing
6 one or more of the site specific collected measures sets in the patient care record
7 for each site within the individual patient relative to one or more other site

8 specific collected measures sets stored in the database to determine a patient
9 status indicator; and
10 the database storing each collected measures set organized by specific site
11 into the patient care record for the individual patient within the database.

1 4. A system according to Claim 3, wherein the one or more site
2 specific collected measures sets and the one or more other site specific collected
3 measures sets both store measures collected from the same relative site.

1 5. A system according to Claim 3, wherein the one or more site
2 specific collected measures sets and the one or more other site specific collected
3 measures sets both store measures collected from a different site.

1 6. A system according to Claim 3, the server further comprising:
2 a comparison module comparing an initial measure selected from the one
3 or more site specific collected measures sets to a sibling measure selected from
4 the one or more other site specific collected measures sets, the initial measure and
5 the sibling measure both relating to the same type of patient information.

1 7. A system according to Claim 3, the server further comprising:
2 a derivation module determining an initial derived measure using at least
3 one measure selected from the one or more site specific collected measures sets
4 and determining a sibling derived measure using at least one measure selected
5 from the one or more other site specific collected measures sets, the initial derived
6 measure and the sibling derived measure both relating to the same type of derived
7 patient information; and
8 a comparison module comparing the initial derived measure to the sibling
9 derived measure.

1 8. A system according to Claim 3, the server further comprising:
2 a comparison module comparing an initial measure selected from the one
3 or more site specific collected measures sets to a peer measure selected from the

4 one or more other site specific collected measures sets, the initial measure relating
5 to a different type of patient information than the peer measure.

1 9. A system according to Claim 3, the server further comprising:
2 a derivation module determining a peer derived measure using at least one
3 measure selected from the one or more other site specific collected measures sets;
4 and
5 a comparison module comparing an initial measure selected from the one
6 or more site specific collected measures sets to the peer derived measure, the
7 initial measure relating to a different type of patient information than the derived
8 patient information to which the peer derived measure relates.

1 10. A system according to Claim 3, the server further comprising:
2 a derivation module determining an initial derived measure using at least
3 one measure selected from the one or more site specific collected measures sets;
4 and
5 a comparison module comparing the initial derived measure to a peer
6 measure selected from the one or more other site specific collected measures sets,
7 the initial derived measure relating to a different type of derived patient
8 information than the patient information to which the peer measure relates.

1 11. A system according to Claim 3, the server further comprising:
2 a derivation module determining an initial derived measure using at least
3 one measure selected from the one or more site specific collected measures sets
4 and determining a peer derived measure using at least one measure selected from
5 the one or more other site specific collected measures sets; and
6 a comparison module comparing the initial derived measure to the peer
7 derived measure, the initial derived measure relating to a different type of derived
8 patient information than the derived patient information to which the peer derived
9 measure relates.

1 12. An system according to Claim 1, further comprising:

2 the database further storing a reference baseline comprising recorded
3 measures which each relate to patient information recorded during an initial time
4 period and comprise either medical device measures or derived measures
5 calculable therefrom; and
6 a database module obtaining at least one of the at least one recorded
7 measure and the at least one other recorded measure from the retrieved reference
8 baseline.

1 13. A system according to Claim 1, wherein the one or more other site
2 specific collected measures sets are stored in the patient care record for the
3 individual patient for whom the patient care indicator has been determined.

1 14. A system according to Claim 1, wherein the one or more other site
2 specific collected measures sets are stored in the patient care records for a group
3 of one or more other individual patients.

1 15. A system according to Claim 1, further comprising:
2 a collection client communicatively interposed between the medical
3 device and network server, the collection client retrieving the collected measures
4 set and downloading the collected measures set from the collection client into the
5 server.

1 16. A system according to Claim 15, wherein the collection client is
2 selected from the group consisting of a programmer, interrogator, recorder,
3 monitor, telemetered signals transceiver, personal computer, digital data
4 processor, and combinations thereof.

1 17. A system according to Claim 1, the application server further
2 comprising:
3 a feedback module providing tiered feedback comprising:
4 at a first level of feedback, communicating an interpretation of the
5 patient status indicator to the individual patient;

6 at a second level of feedback, communicating a notification of
7 potential medical concern based on the patient status indicator to the individual
8 patient;

9 at a third level of feedback, communicating a notification of
10 potential medical concern based on the patient status indicator to medical
11 personnel in local proximity to the individual patient; and

12 at a fourth level of feedback, communicating a set of
13 reprogramming instructions based on the patient status indicator to the medical
14 device.

1 18. A system according to Claim 17, wherein the automated feedback
2 comprises at least one of the group consisting of a peer group status indicator, a
3 historical status indicator, a trend indicator, a medicinal efficacy indicator, and a
4 wellness indicator.

1 19. A system according to Claim 17, wherein the feedback module
2 communicates over a communications link which comprises at least one of the
3 following: internetwork link, intranetwork link, serial link, data telephone link,
4 satellite link, radio-frequency link, infrared link, fiber optic link, coaxial cable
5 link, television link, and combinations thereof.

1 20. A system according to Claim 17, wherein the feedback client is
2 selected from the group consisting of a personal computer, facsimile machine,
3 telephone instrument, network computer, wireless computer, personal data
4 assistant, television, digital data processor, and combinations thereof.

1 21. A system according to Claim 1, the application server further
2 comprising:
3 an analysis module dynamically analyzing the one or more of the collected
4 measures sets in the patient care record for the individual patient.

1 22. A system according to Claim 1, the application server further
2 comprising:

3 an analysis module analyzing the one or more of the collected measures
4 sets in the patient care record for the individual patient in a batch comprising the
5 one or more of the collected measures sets in patient care records for a plurality of
6 individual patients.

1 23. A system according to Claim 1, wherein the medical device
2 communicates over a communications link which comprises at least one of the
3 following: internetwork link, intranetwork link, serial link, data telephone link,
4 satellite link, radio-frequency link, infrared link, fiber optic link, coaxial cable
5 link, television link, and combinations thereof.

1 24. A system according to Claim 1, wherein the database comprises at
2 least one of the following: volatile storage, non-volatile storage, removable
3 storage, fixed storage, random access storage, sequential access storage,
4 permanent storage, erasable storage, and combinations thereof.

1 25. A system according to Claim 24, wherein the organization of the
2 database comprises at least one of the following: flat file, hierarchical database,
3 relational database, distributed database, and combinations thereof.

1 26. A system according to Claim 1, wherein the medical device is
2 selected from the group consisting of a pacemaker, cardioverter defibrillator, heart
3 failure monitor, event monitor, cardiopulmonary monitor, metabolic monitor or
4 device, endocrinology monitor or device, hematological monitor or device,
5 neuromuscular monitor or device, gastrointestinal monitor or device,
6 genitourinary monitor or device, and combinations thereof.

1 27. A system according to Claim 1, wherein the set of collected
2 measures comprises at least one of the following: atrial electrical activity,
3 ventricular electrical activity, time of day, activity level, cardiac output, oxygen
4 level, cardiovascular pressure measures, pulmonary measures, interventions
5 made, and combinations thereof.

1 28. A system according to Claim 27, the set of collected measures
2 further comprising derived measures selected from the group consisting of linear
3 measures derived from the set of collected measures, non-linear measures derived
4 from the set of collected measures, and combinations thereof.

1 29. A method for collection and analysis of regularly retrieved patient
2 information for automated remote patient care, comprising:
3 regularly recording and storing measures sets comprising individual
4 measures which each relate to patient information by a medical device having a
5 sensor for monitoring at least one physiological measure of an individual patient;
6 periodically receiving a set of the collected measures retrieved on a
7 substantially regular basis from the medical device;
8 collecting one or more patient care records into a database, comprising:
9 organizing one or more patient care records which each comprise a
10 plurality of the collected measures sets;
11 storing the collected measures set into a patient care record for the
12 individual patient; and
13 analyzing one or more of the collected measures sets in the patient care
14 record for the individual patient relative to one or more other collected measures
15 sets stored in the database server to determine a patient status indicator.

1 30. A method according to Claim 29, further comprising:
2 receiving a set of quality of life measures recorded by the individual
3 patient;
4 storing the collected quality of life measures set into the patient care
5 record for the individual patient within the database; and
6 determining a change in patient status by comparing at least one recorded
7 quality of life measure to at least one other corresponding recorded quality of life
8 measure.

1 31. A method according to Claim 29, further comprising:

2 repeatedly receiving one or more collected measures sets which are each
3 recorded by a sensor which monitors at least one physiological measure of the
4 individual patient, each such sensor monitoring a site within the individual patient
5 unique from the site monitored by any other such sensor;
6 storing each collected measures set organized by specific site into the
7 patient care record for the individual patient within the database; and
8 analyzing one or more of the site specific collected measures sets in the
9 patient care record for each site within the individual patient relative to one or
10 more other site specific collected measures sets stored in the database to
11 determine a patient status indicator.

1 32. A method according to Claim 31, wherein the one or more site
2 specific collected measures sets and the one or more other site specific collected
3 measures sets both store measures collected from the same relative site.

1 33. A method according to Claim 31, wherein the one or more site
2 specific collected measures sets and the one or more other site specific collected
3 measures sets both store measures collected from a different site.

1 34. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 comparing an initial measure selected from the one or more site specific
4 collected measures sets to a sibling measure selected from the one or more other
5 site specific collected measures sets, the initial measure and the sibling measure
6 both relating to the same type of patient information.

1 35. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 determining an initial derived measure using at least one measure selected
4 from the one or more site specific collected measures sets;
5 determining a sibling derived measure using at least one measure selected
6 from the one or more other site specific collected measures sets, the initial derived

7 measure and the sibling derived measure both relating to the same type of derived
8 patient information; and
9 comparing the initial derived measure to the sibling derived measure.

1 36. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 comparing an initial measure selected from the one or more site specific
4 collected measures sets to a peer measure selected from the one or more other site
5 specific collected measures sets, the initial measure relating to a different type of
6 patient information than the peer measure.

1 37. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 determining a peer derived measure using at least one measure selected
4 from the one or more other site specific collected measures sets; and
5 comparing an initial measure selected from the one or more site specific
6 collected measures sets to the peer derived measure, the initial measure relating to
7 a different type of patient information than the derived patient information to
8 which the peer derived measure relates.

1 38. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 determining an initial derived measure using at least one measure selected
4 from the one or more site specific collected measures sets; and
5 comparing the initial derived measure to a peer measure selected from the
6 one or more other site specific collected measures sets, the initial derived measure
7 relating to a different type of derived patient information than the patient
8 information to which the peer measure relates.

1 39. A method according to Claim 31, the operation of analyzing the
2 one or more site specific collected measures sets further comprising:
3 determining an initial derived measure using at least one measure selected
4 from the one or more site specific collected measures sets;

5 determining a peer derived measure using at least one measure selected
6 from the one or more other site specific collected measures sets; and
7 comparing the initial derived measure to the peer derived measure, the
8 initial derived measure relating to a different type of derived patient information
9 than the derived patient information to which the peer derived measure relates.

1 40. A method according to Claim 39, further comprising:
2 retrieving a reference baseline comprising recorded measures which each
3 relate to patient information recorded during an initial time period and comprise
4 either medical device measures or derived measures calculable therefrom; and
5 obtaining at least one of the at least one recorded measure and the at least
6 one other recorded measure from the retrieved reference baseline.

1 41. A method according to Claim 39, wherein the one or more other
2 site specific collected measures sets are stored in the patient care record for the
3 individual patient for whom the patient care indicator has been determined.

1 42. A method according to Claim 39, wherein the one or more other
2 site specific collected measures sets are stored in the patient care records for a
3 group of one or more other individual patients.

1 43. A method according to Claim 39, further comprising:
2 providing tiered feedback comprising:
3 at a first level of feedback, communicating an interpretation of the
4 patient status indicator to the individual patient;
5 at a second level of feedback, communicating a notification of
6 potential medical concern based on the patient status indicator to the individual
7 patient;
8 at a third level of feedback, communicating a notification of
9 potential medical concern based on the patient status indicator to medical
10 personnel in local proximity to the individual patient; and

11 at a fourth level of feedback, communicating a set of
12 reprogramming instructions based on the patient status indicator to the medical
13 device.

1 44. A computer-readable storage medium holding code for collection
2 and analysis of regularly retrieved patient information for automated remote
3 patient care, comprising:
4 code for regularly recording and storing measures sets comprising
5 individual measures which each relate to patient information by a medical device
6 having a sensor for monitoring at least one physiological measure of an individual
7 patient;
8 code for periodically receiving a set of the collected measures retrieved on
9 a substantially regular basis from the medical device;
10 code for collecting one or more patient care records into a database,
11 comprising:
12 code for organizing one or more patient care records which each
13 comprise a plurality of the collected measures sets;
14 code for storing the collected measures set into a patient care
15 record for the individual patient; and
16 code for analyzing one or more of the collected measures sets in the
17 patient care record for the individual patient relative to one or more other
18 collected measures sets stored in the database server to determine a patient status
19 indicator.

1 45. A storage medium according to Claim 44, further comprising:
2 code for receiving a set of quality of life measures recorded by the
3 individual patient;
4 code for storing the collected quality of life measures set into the patient
5 care record for the individual patient within the database; and
6 code for determining a change in patient status by comparing at least one
7 recorded quality of life measure to at least one other corresponding recorded
8 quality of life measure.

1 46. A storage medium according to Claim 44, further comprising:
2 code for repeatedly receiving one or more collected measures sets which
3 are each recorded by a sensor which monitors at least one physiological measure
4 of the individual patient, each such sensor monitoring a site within the individual
5 patient unique from the site monitored by any other such sensor;
6 code for storing each collected measures set organized by specific site into
7 the patient care record for the individual patient within the database; and
8 code for analyzing one or more of the site specific collected measures sets
9 in the patient care record for each site within the individual patient relative to one
10 or more other site specific collected measures sets stored in the database to
11 determine a patient status indicator.

1 47. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:
4 code for comparing an initial measure selected from the one or more site
5 specific collected measures sets to a sibling measure selected from the one or
6 more other site specific collected measures sets, the initial measure and the sibling
7 measure both relating to the same type of patient information.

1 48. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:
4 code for determining an initial derived measure using at least one measure
5 selected from the one or more site specific collected measures sets;
6 code for determining a sibling derived measure using at least one measure
7 selected from the one or more other site specific collected measures sets, the
8 initial derived measure and the sibling derived measure both relating to the same
9 type of derived patient information; and
10 code for comparing the initial derived measure to the sibling derived
11 measure.

1 49. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:
4 code for comparing an initial measure selected from the one or more site
5 specific collected measures sets to a peer measure selected from the one or more
6 other site specific collected measures sets, the initial measure relating to a
7 different type of patient information than the peer measure.

1 50. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:
4 code for determining a peer derived measure using at least one measure
5 selected from the one or more other site specific collected measures sets; and
6 code for comparing an initial measure selected from the one or more site
7 specific collected measures sets to the peer derived measure, the initial measure
8 relating to a different type of patient information than the derived patient
9 information to which the peer derived measure relates.

1 51. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:
4 code for determining an initial derived measure using at least one measure
5 selected from the one or more site specific collected measures sets; and
6 code for comparing the initial derived measure to a peer measure selected
7 from the one or more other site specific collected measures sets, the initial derived
8 measure relating to a different type of derived patient information than the patient
9 information to which the peer measure relates.

1 52. A storage medium according to Claim 46, the operation of
2 analyzing the one or more site specific collected measures sets further
3 comprising:

4 code for determining an initial derived measure using at least one measure
5 selected from the one or more site specific collected measures sets;
6 code for determining a peer derived measure using at least one measure
7 selected from the one or more other site specific collected measures sets; and
8 code for comparing the initial derived measure to the peer derived
9 measure, the initial derived measure relating to a different type of derived patient
10 information than the derived patient information to which the peer derived
11 measure relates.

1 53. An storage medium according to Claim 44, further comprising:
2 code for retrieving a reference baseline comprising recorded measures
3 which each relate to patient information recorded during an initial time period and
4 comprise either medical device measures or derived measures calculable
5 therefrom; and
6 code for obtaining at least one of the at least one recorded measure and the
7 at least one other recorded measure from the retrieved reference baseline.

1 54. A storage medium according to Claim 44, further comprising:
2 code for providing tiered feedback comprising:
3 at a first level of feedback, communicating an interpretation of the
4 patient status indicator to the individual patient;
5 at a second level of feedback, communicating a notification of
6 potential medical concern based on the patient status indicator to the individual
7 patient;
8 at a third level of feedback, communicating a notification of
9 potential medical concern based on the patient status indicator to medical
10 personnel in local proximity to the individual patient; and
11 at a fourth level of feedback, communicating a set of
12 reprogramming instructions based on the patient status indicator to the medical
13 device.